$c = 2.9979\ 10^{8}$ ms^{-1} $e = 1.6022\ 10^{-19}$ C $m_e = 9.1091\ 10^{-31}$ kg $m_p = 1.6725\ 10^{-27}$ kg

$$\vec{a}(t) = a_x(t)\,\vec{i} + a_y(t)\,\vec{j} + a_z(t)\,\vec{k} \qquad \vec{a}\cdot\vec{b} = |\vec{a}||\vec{b}|\cos(\alpha) \qquad \left|\vec{a}\times\vec{b}\right| = |\vec{a}||\vec{b}|\sin(\alpha)$$

$$\vec{r}(t) = x(t)\,\vec{i} + y(t)\,\vec{j} + z(t)\,\vec{k} \quad \vec{v}(t) = \frac{\mathrm{d}\vec{r}}{\mathrm{d}t} \quad \vec{a}(t) = \frac{\mathrm{d}\vec{v}}{\mathrm{d}t} \quad \vec{a} = \vec{a}_t + \vec{a}_n \quad \vec{a}_t = \frac{\mathrm{d}v}{\mathrm{d}t}\vec{\tau}^0 \quad \vec{a}_n = \frac{v^2}{r}\vec{n}^0$$

$$x(t) = x_0 + v_{0x}t + \frac{1}{2}a_x t^2 \quad v_x(t) = v_{0x} + a_x t \quad v_{PA} = v'_{PB} + v_{BA} \quad \vec{p} = m\vec{v} \quad \sum\vec{F} = m\vec{a}$$

$$\sum\vec{F} = \frac{\mathrm{d}\vec{p}}{\mathrm{d}t} \quad F_t = fN \quad W = \int\vec{F}\cdot\mathrm{d}\vec{r} \quad W_G = mg(y_1 - y_2) \quad \vec{F}_P = -k\vec{x} \quad W_{F_p} = \frac{1}{2}k(x_1^2 - x_2^2)$$

$$E_k = \frac{1}{2}mv^2 \quad P = \frac{\mathrm{d}W}{\mathrm{d}t} \quad P = \vec{F}\cdot\vec{v} \quad E_p(h) = mgh \quad E_p(x) = \frac{1}{2}kx^2 \quad E_m = E_k + E_\mathrm{p}$$

$$\Delta E_m = W_{nekonz} \quad \Delta E = \Delta mc^2 \quad \theta = \frac{s}{r} \quad \vec{\omega} = \frac{\mathrm{d}\theta}{\mathrm{d}t}\vec{n} \quad \vec{\varepsilon} = \frac{\mathrm{d}\vec{\omega}}{\mathrm{d}t} \quad \vec{v} = \vec{\omega}\times\vec{r} \quad \vec{a}_t = \vec{\varepsilon}\times\vec{r} \quad \vec{a}_n = \vec{\omega}\times\vec{v}$$

$$\theta(t) = \theta_0 + \omega_0 t + \frac{1}{2}\varepsilon t^2 \qquad I = \sum_i m_i r_i^2 \qquad I = \int r^2\mathrm{d}m \qquad I = I_0 + md^2 \qquad E_k = \frac{1}{2}I\omega^2$$

$$\vec{M} = \vec{r}\times\vec{F} \qquad \sum\vec{M} = I\vec{\varepsilon} \quad x(t) = A\sin(\omega t + \alpha) \qquad \omega = 2\pi f = \frac{2\pi}{T} \qquad \frac{\mathrm{d}^2x}{\mathrm{d}t^2} + \frac{k}{m}x = 0$$

$$\frac{\mathrm{d}^2x}{\mathrm{d}t^2} + 2B\frac{\mathrm{d}x}{\mathrm{d}t} + \omega^2 x = 0 \qquad \omega' = \sqrt{\omega^2 - B^2} \qquad x(t) = A_o e^{-\beta t}\sin(\omega t + \alpha)$$

$$y(x,t) = y_m\sin(kx - \omega t + \varphi) \qquad k = \frac{2\pi}{\lambda} \quad \lambda = Tv \quad v = \sqrt{\frac{F}{\mu}}$$

$$\sin(\alpha) + \sin(\beta) = 2\sin\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2} \qquad y'(x,t) = 2y_m\sin(kx)\cos(\omega t)$$

$$y'(x,t) = 2y_m\cos(\frac{\varphi}{2})\sin(kx - \omega t + \frac{\varphi}{2})$$

$$\vec{F}_2 = \frac{1}{4\pi\varepsilon_0}\frac{Q_1Q_2}{r^2}\vec{r}_{1,2} \qquad \vec{E} = \frac{\vec{F}_{Q_0}}{Q_0} \quad \vec{p} = Q\vec{d} \quad \vec{M} = \vec{p}\,x\,\vec{E} \quad I = \frac{\mathrm{d}Q}{\mathrm{d}t} \quad U = RI \quad P = UI$$

$$\varepsilon = \frac{\mathrm{d}W_z}{\mathrm{d}t} \qquad \sum\varepsilon_i - \sum R_j I_j = 0 \qquad \sum I_i = \sum I_j \quad C = \frac{Q}{U} \quad \frac{\mathrm{d}Q}{\mathrm{d}t} + \frac{1}{RC}Q = \varepsilon$$

$$Q(t) = C\varepsilon(1 - e^{-\frac{t}{RC}}) \qquad \frac{\mathrm{d}Q}{\mathrm{d}t} + \frac{1}{RC}Q = 0 \qquad Q(t) = Q_0 e^{-\frac{t}{RC}}$$